

AN ANALYSIS OF PAIN INTENSITY, CERVICAL LORDOSIS, NECK AWARENESS AND NECK DISABILITY LEVEL IN ACADEMICS WITH CHRONIC NECK PAIN

KRONİK BOYUN AĞRILI AKADEMİSYENLERDE AĞRI ŞİDDETİ, SERVİKAL LORDOZ, BOYUN FARKINDALIĞI VE BOYUN ÖZÜR DÜZEYİNİN İNCELENMESİ

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Abstract

Background: Academics are considered to be among the occupational groups where the risk of experiencing chronic neck pain is the highest due to factors such as ergonomic conditions and stress. The purpose of this study is to look into the relationship between pain severity and cervical lordosis angle, neck awareness, and neck disability level in academics with chronic neck pain, and to see if the results differ by gender.

Methods: 106 volunteer academicians participated in this study. The severity of pain was assessed using the Visual Analogue Scale. Cervical lordosis measurements were made using a flexible ruler. Neck awareness was evaluated with the Fremantle Neck Awareness Questionnaire.

Results: Neck disability levels were evaluated with the Neck Disability Questionnaire. Female academicians had a higher mean severity of neck pain than male academicians, and the difference was statistically significant.

Conclusions: Pain severity was associated with neck disability and neck awareness in academics. Neck awareness was found to be slightly reduced in academics with chronic neck pain. More studies on chronic neck pain in academic staff are needed.

Key Words: Neck pain, Awareness, Academics, Lordosis, Disability

Özet

Amaç: Akademisyenler, ergonomik koşullar ve stres gibi faktörler nedeniyle kronik boyun ağrısı yaşama riskinin en yüksek olduğu meslek grupları arasında sayılmaktadır. Bu çalışmanın amacı, kronik boyun ağrısı olan akademisyenlerde ağrı şiddeti ile servikal lordoz açısı, boyun farkındalığı ve boyun özür düzeyi arasındaki ilişkiyi incelemek ve sonuçların cinsiyete göre farklılık gösterip göstermediğini görmektir.

Yöntem: Bu çalışmaya 106 gönüllü akademisyen katıldı. Ağrı şiddeti Visual Analog Skala kullanılarak değerlendirildi. Servikal lordoz ölçümleri esnek bir cetvel kullanılarak yapıldı. Boyun farkındalığı, Fremantle Boyun Farkındalık Anketi ile değerlendirildi.

Bulgular: Boyun özür düzeyleri Boyun Özür düzeyi Anketi ile değerlendirildi. Kadın akademisyenlerin boyun ağrısı şiddeti erkek akademisyenlere göre daha yüksekti ve aradaki fark istatistiksel olarak anlamlıydı.

Sonuç: Akademisyenlerde ağrı şiddeti, boyun özür düzeyini ve boyun farkındalığı ile ilişkiliydi. Kronik boyun ağrısı olan akademisyenlerde boyun farkındalığının hafif seviyede azaldığı tespit edildi. Akademik personelde kronik boyun ağrısı ile ilgili daha fazla çalışma yapılması gerekmektedir.

Anahtar Kelimeler: Boyun ağrısı, Farkındalık, Akademisyenler, Lordosis, Engellilik

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INTRODUCTION

Neck pain is a discomfort that is experienced by 70% of the population at some point in their lives. Previous studies have shown that the main factors causing neck pain are occupation, high body mass index, working sedentarily at a desk for a long time, unsuitable ergonomic conditions, gender, weakness of the cervical muscles, and high levels of anxiety. When evaluated in terms of these factors, academics are an important group who are at risk of experiencing chronic neck pain (1,2). A previous study reported that the musculoskeletal disorders experienced by academics were primarily in the neck region (59%), followed by shoulder (53%) and waist problems (47%) (3). In a study conducted by Cagnie et al. on 720 university office workers, the prevalence of neck pain that lasted longer than one year was reported as 45.5%, and women were twice as likely to have neck pain as men (4).

In individuals with chronic neck pain, afferent information input in the cervical region results in a decreased range of joint motion, alterations in the natural lordosis angle, restrictions on everyday life activities, and impaired proprioception. The changes in the body perceptions of individuals occur in the form of feeling the growth-shrinking of the neck region or unawareness being unaware of about the spatial position of the neck (5,6). Considering the positive effects of increasing body awareness, such as decreasing musculoskeletal symptoms in individuals with chronic pain and regulating balance and respiration, it is clinically important to include body awareness in physiotherapy assessments (7).

Cervical lordosis, defined as the convexity of the spine in the sagittal plane, is adversely affected by factors such as aging, inflammatory diseases, and overloading the spine. In adult individuals, 31–40° is considered clinically normal for cervical lordosis. A previous study reported that

individuals with higher or lower values had more cervical region complaints (8). The literature has reported various results with different occupational groups regarding the relationship between cervical lordosis and neck pain intensity (9).

Although the literature contains many studies on chronic neck pain, few previous studies have focused on the academic population, which is one of the occupational groups that experience neck pain most frequently. Furthermore, no previous studies have examined neck awareness in academic staff. The aim of our study was to evaluate cervical lordosis and neck disability levels in academics, to examine the effects of neck pain on daily life, and to evaluate neck awareness. In addition, our study aimed to evaluate whether the results differed in terms of gender and to serve as a reference for future studies in the field.

A literature review showed that a large majority of studies conducted on academics were prevalence studies. In addition, no studies were found in which neck awareness, cervical lordosis, or neck disability level were evaluated in academics. Our study, which examined the correlation of pain intensity with cervical lordosis, neck awareness, and level of neck disability in academics with chronic neck pain, was completed with the voluntary participation of 106 academics. Our study found that pain intensity correlated with neck awareness and level of neck disability.

In a study conducted at a university in Nigeria, the prevalence of one-year-long neck pain in academic staff was reported to be 71.7% (16). Chiu et al. found that the prevalence of one-year-long neck pain in academic staff at a university in Hong Kong was 46.7%, and the correlation between gender and neck pain was significant. The percentage of female academic staff experiencing neck pain (62%) was found to be higher than that of male academic staff (38%) (1). In our study, we found that the great majority of academics

with chronic neck pain were women. Similar to the results of our study, studies reported in the literature have shown that women experienced higher rates of neck pain than men. In a systematic review that examined prevalence studies on neck pain, 83% of the included studies reported a higher prevalence of neck pain for women (17). Özsoy et al. found in their study with academic nurses that musculoskeletal system pain scores were higher in female participants than in male participants (18). Meaza et al. reported that neck pain was the most frequent pain in academics, followed by waist and shoulder pain. They also found that the probability of developing musculoskeletal pain was three times higher in female academics than in male academics. The authors believe that this is due to the fact that women are more sensitive to pain than men, and they are physically more fragile due to hormonal status and work-life balance (19). Most of the studies in the literature have reported that gender affects neck pain intensity and that women have higher pain intensity. Various factors, such as the fact that women have a smaller cervical area vertebrae, men have greater muscle strength and endurance in the cervical area than women, women have a higher rate of type 1 muscle fibres, women have a lower pain threshold, and hormonal differences may cause women to become more likely to experience neck pain (20). In addition to these reasons, we believe that the reason that female academics experience more intense pain is related to a higher workload and a higher stress level caused by familial responsibilities.

The natural cervical lordosis angle is an important component in providing proper spinal alignment, correct posture, and balance. Previous studies have reported that patients with decreased cervical lordosis experience problems with headache, neck and shoulder ache, and chewing problems, and they spend more energy maintaining their posture (21,22). Unlike these studies, there are a large number of studies which report no correlation between

neck pain and decreased cervical lordosis. As a result of the study in which Boy et al. examined the correlation between VAS scores of patients with chronic neck pain and cervical lordosis, no significant correlation was found between neck pain and cervical lordosis (23).

MATERIALS AND METHODS

Sample Population

This descriptive study was conducted between November 2019 and February 2020 at İnönü University. There are 1593 academics working at İnönü University and the population of the study consists of academics diagnosed with chronic neck pain. Whether the academics were diagnosed was found out with question-answer method. A pilot study was conducted with 10 academics with chronic pain to calculate the sample of the study. As a result of the study, mean NDI (Neck Disability Index) score was found as 10 ± 4 . In the power analysis based on the pilot study, calculations were made at 95% confidence interval and $\alpha=0.05$ and $\beta=0.80$, and the required sample was determined as 106 individuals.

Inclusion criteria of the study were having a professional experience of a year and longer, having been diagnosed with chronic neck pain, having chronic neck pain for at least 3 months and longer, having a VAS (Visual Analog Scale) value of ≥ 2 , having a NDI score of ≥ 5 . Exclusion criteria were having used regular medication for the past month, having neurological or immunological diseases, having undergone cervical surgery, having received physiotherapy and rehabilitation for the neck area in the past six months and presence of sensory complaints accompanying neck pain. This study was approved by the Research Ethics Committee of the institution. The participants were informed that participation in the study was on a voluntary basis, they were informed about the purpose and the content and they signed informed consent form.

Data Collection and Processing

Descriptive Information Form, VAS, flexible ruler, NDI and FNAQ-T (Fremantle Neck Awareness Questionnaire-Turkish) were used in the study.

Descriptive Information Form: This form was used to find out the descriptive characteristics of the academics. It includes information such as gender, age, height, weight, academic title and working years in the profession.

Visual Analog Scale (VAS): VAS, the validity and reliability study of which was conducted by Price et al., is a scale that can be used to evaluate all kinds of pain and enables the conversion of values that cannot be measured numerically (11). After descriptive information of the academics was taken, they were asked to indicate their pain state (while reading, working on the computer and carrying things) by marking on this line, and the severity was measured with a ruler and recorded in cm.

Flexible Ruler: Flexible ruler method is a reliable method used in the measurement of cervical, thoracic and lumbar spine curvature (12). The measurement was made with a 40 cm long flexible ruler (United Kingdom, Helix) when the academics were standing, with their arms on the sides in a relaxed posture and head upright, eyes looking straight ahead. C2 and C7 vertebrae of the academics were palpated and marked by using removable adhesive skin markers. Vertebrae were counted starting from the first palpable spinous process C2 below the occiput, and the position of C7 was confirmed and marked with neck extension. The flexible ruler was then placed on the cervical lordosis between these two points, and marks indicating the place of C2 and C7 spinous processes were placed on it. (Fig. 1). Flexible ruler was placed on millimetric paper and the resulting curve was projected. Cervical lordosis angle of deviation was determined with the help of angle-side-angle connection by making a vertical angle from the peak point of the curve to the starting line. In order to determine the angle, cervical lordosis index was obtained in degrees by using the following formula (Fig. 2) (12,13).

Fremantle Neck Awareness Questionnaire-Turkish (FNAQ-T): Turkish version validity and reliability study of the Questionnaire was conducted by Onan in 2018. FNAQ-T is a 9-item questionnaire that evaluates neck perception, attention and proprioceptive awareness of

individuals with chronic neck pain. The items in the Likert type questionnaire is scored between 0 and 4 as 0=Never, 1=Rarely, 2=Sometimes, 3=Often, 4=Always. Total score is 36. Higher scores show decreased neck awareness (6).

Neck Disability Index (NDI): Turkish validity and reliability study was conducted in 2008 by Aslan et al. It is commonly used in clinics to evaluate the disability level of patients with acute and chronic neck pain. Each item of this 10-item index is scored between 0 and 5. A total score between 0 and 4 indicates no disability, a total score between 5 and 14 indicates mild disability, a total score between 15 and 24 indicates moderate disability, a total score between 25 and 34 indicates severe disability and a score of 35 and higher indicates total disability (14).

Ethical Consideration

Ethical approval (2019, 190194) from Muğla Sıtkı Koçman University Ethics Committee and permission from Inonu University Rectorate (2020,E.275) were obtained before starting the study.

Statistical Analysis

The data obtained as a result of the study was analyzed by using SPSS (Statistical Package for Social Sciences, United States of America IBM for Windows) 22.0 package program. Numbers and percentages were used to show descriptive characteristics. Mean \pm standard deviation and median values were used to show continuous variables. Normality distribution and homogeneity of the data collected was examined with histogram graphs, Skewness-Kurtosis values and Shapiro Wilk test. As a result of this, the data were found to be normally distributed. Pearson correlation analysis was used to find out whether there was a significant correlation between pain intensity and cervical lordosis and scale scores. A correlation coefficient between 0.3 and 0.7 was considered as moderate correlation (15). $p < 0.05$ was considered as statistically significant.

RESULTS

Table 1 shows the physical and descriptive characteristics of the academics who participated in our study. When working years in the profession

were examined, it was found that a great majority of the sample (41.5%) consisted of participants who had worked for 1-5 years.

Table 1. Demographic and physical characteristics of academics.

Physical characteristics	Female (N:74) X±SD	Male (N:32) X±SD	Total (N:106) X±SD
Age (y)	36.18 ± 7.41	39.50 ± 8.76	37.18 ± 7.95
Length (cm)	163 ± 5.31	176 ± 5.650	167 ± 8.30
Body weight (kg)	63.06 ± 9.85	84.71 ± 11.21	69.60 ± 14.29
Demographic characteristics	N	%	
Academic Title			
Research Assistant	27	25.5	
Lecturer	37	34.9	
Assistant professor	24	22.6	
Associate professor	7	6.6	
Professor	11	10.4	
Years of experience			
1-5	44	41.5	
6-10	27	25.5	
11-15	10	9.4	
≥16	25	23.6	
Daily working hours			
1-4	18	17.0	
5-7	62	58.5	
8-10	26	24.5	

SD: Standard Deviation.

Table 2. Comparison of Academicians' Gender and Cervical Lordosis Values, VAS, NDI, FreNAQ-T Scores

Variables	Gender		t	p
	Female (N:74) X±SD	Male (N:32) X±SD		
Cervical Lordosis	32.21 ± 2.77	32.03 ± 2.85	0.30	0.75
VAS	6.79 ± 1.36	6.06 ± 1.45	2.42	0.01*
NDI	12.50 ± 5.16	10.12 ± 3.81	2.63	0.01*
FreNAQ-T	12.32 ± 4.79	8.81 ± 3.54	0.40	0.07

SD: Standard Deviation; VAS: Visual Analog Scale, NDI: Neck Disability Index, FreNAQ-T: Fremantle Neck Awareness Questionnaire Turkish, *, $p < 0,05$.

When daily mean pain scores were examined, it was found that female academics had higher pain scores than male academics. Mean

cervical lordosis value of female participants was found as $32.21^\circ \pm 2.77^\circ$, while mean cervical lordosis value of female participants was found as

32.03° ± 2.85°. When FNAQ-T scores were examined, it was found that mean scores of female participants was 12.32 ± 10.79, while mean scores of male participants was 8.81 ± 8.54. Mean NDI score was 12.50 ± 5.16 in female participants, while it was 10.12 ± 3.81 in male participants. (Table 2).

Table 2 shows the comparison between gender and cervical lordosis values, VAS, NDI,

FNAQ-T mean scores of the academics. When cervical lordosis and FNAQ-T scores were compared in terms of gender, no statistically significant difference was found (p>0.05). When NDI and VAS scores were compared in terms of gender, statistically significant difference was found (p<0.05).

Table 3. Analysis of the Relationship between Academicians' VAS Scores and Cervical Lordosis, FreNAQ-T and NDI.

Variables	NDI		FreNAQ-T		Cervical lordosis	
	r	p	r	p	r	p
VAS	0.403	0.000*	0.195	0.045*	0.024	0.807

VAS: Visual Analog Scale; NDI: Neck Disability Index; FreNAQ-T; Fremantle Neck Awareness Questionnaire Turkish; r: correlation coefficient. *: p<0.05

Table 3. shows the correlation between VAS scores and cervical lordosis, NDI and FNAQ-T. Significant, moderate and positive correlation was found between the participants' daily mean pain scores and NDI score (r=0.403; p<0.01). When the correlation between pain score and FNAQ-T score was examined, the correlation between pain score and FNAQ-T total score was low, statistically significant and positive (r=0.195; p<0.05). No significant correlation was found between cervical lordosis and pain in activity score (p>0.05).

DISCUSSION

A large majority of studies conducted on academics were found to be prevalence studies. In addition, no studies were found in which neck awareness, cervical lordosis and neck disability level were evaluated in academics. Our study which examined the correlation of pain intensity with cervical lordosis, neck awareness and neck disability level in academics with chronic neck pain was completed with the voluntary participation of 106 academics. As a result of our study, pain intensity was found to be correlated with neck awareness and neck disability level.

When the literature is reviewed, it can be seen that there are prevalence studies on

musculoskeletal system disorders experienced by academics. In a study conducted at a university in

Nigeria, one-year-long neck pain prevalence of academic staff was reported as 71.7% (16). Chiu et al. found that one-year-long neck pain prevalence of academic staff at a university in Hong Kong was 46.7% and the correlation between gender and neck pain was found to be significant. The percentage of female academic staff experiencing neck pain (62%) was found to be higher than that of male academic staff (38%) (1). It was found that the great majority of academics with chronic neck pain were women in our study. This result shows that chronic neck pain was more common in female academics who participated in our study. Similar to the results of our study, there are results in literature that women experience higher rates of neck pain than men. In a systematic review which examined prevalence studies on neck pain in the world, 83% of all studies included reported higher prevalence for women (17). Özsoy et al. found in their study with academic nurses that musculoskeletal system pain scores were higher in female participants than male participants (18). Meaza et al. reported that neck pain was the most frequent pain in academics, followed by waist and shoulder pain. They also found that the probability of developing

musculoskeletal system pain was 3 times higher in female academics than male academics. Authors believe that this is due to the fact that women are more sensitive to pain than men and they are physically more fragile, due to hormonal status and work-life balance (19). Most of the studies in literature have reported that gender affects neck pain intensity and women have higher pain intensity. Various factors such as the fact that women have smaller cervical area vertebrae, men have higher muscle strength and endurance in cervical area than women, women have higher rate of type 1 muscle fibers, women have lower pain threshold and hormonal differences may cause women to become more inclined to experience neck pain (20). In addition to these, we believe that the reason why female academics experience more intense pain is both more work load and the higher stress caused by familial responsibilities.

Natural cervical lordosis angle is an important component in providing proper spinal alignment, correct posture and balance. Studies conducted have reported that patients with decreased cervical lordosis experience problems of headache, neck and shoulder ache and chewing problems and they spend more energy to maintain posture (21,22). Unlike these studies, there are a large number of studies which report no correlation between neck pain and decreased cervical lordosis. As a result of the study in which Boy et al. examined the correlation between VAS scores of patients with chronic neck pain and cervical lordosis, no significant correlation was found between neck pain and cervical lordosis (23). Grob et al. reported that there was no difference between patients with chronic neck pain who were older than 45 years of age and controls and there was no correlation between cervical lordosis and neck pain (24). When the literature was reviewed, no studies were found in which cervical lordosis of academics were evaluated. According to the results of our study, mean cervical lordosis degrees of academics with chronic neck pain were within the range considered normal. No significant correlation was found between participants' cervical lordosis angles and VAS scores. Our study results support the results of studies reporting no significant correlation between pain intensity and cervical lordosis. We

think that the reason why there was no correlation between pain intensity and cervical lordosis was due to the fact that degenerative changes in the neck area were not advanced.

Our study examined the correlation between FNAQ-T score and pain intensity. Low, positive and significant correlation was found between FNAQ-T total score and pain intensity. In addition, it was found that male academics had higher neck awareness than female academics. Onan et al. reported low and moderate level of correlation between pain intensity and neck awareness of patients in the study they conducted on individuals with chronic neck pain (6). Yamashita et al. reported positive and moderate correlation between VAS scores and questionnaire scores of individuals with chronic pain in their Japanese validity and reliability study on Fremantle Neck Awareness Questionnaire (25). Studies conducted show that pain intensity affects neck proprioception and perception and decreases awareness (26). It is thought that the reason for this is the damage to afferent information and input and sensorimotor integration in the cervical region. Our study supports the results of other studies conducted.

When the mean NDI scores of academics were examined, it was found that disability levels were mild. Female academics were found to have higher mean NDI scores than male academics. In their study, Luo and Young found that the NDI scores of women were higher than those of men, although the difference between was not significant (27,28). It is thought that the reason why disability level of female academics in our study was higher was due to the fact that female academics had higher pain scores than male academics. When the correlation between neck disability level and pain intensity was examined, a positive and moderate correlation was found. A large number of studies conducted have shown a significant correlation between NDI and VAS. In a study conducted with musicians with chronic neck pain, positive correlation was found between musicians' pain scores and neck disability level (29). Hwang et al. reported positive and high correlation between VAS scores and NDI scores of individuals with chronic neck pain (30). These studies show that

pain intensity causes limitations in individuals' daily activities and increases neck disability level.

Limitations

Limitations of our study can be listed as the fact that the study represents a single city, it was conducted in one university, and participation in the surveys was not distributed in similar numbers among faculties and higher schools.

CONCLUSION

It was found that chronic neck pain was more common in female academics who participated in our study. It was found that neck disability level of the participants was mild and female academics had higher neck disability level than male academics. It can be seen that neck awareness decreased mildly and neck awareness of female academics was lower than that of male academics. It was found that cervical lordosis values of the participants were within normal ranges and there was no correlation between pain intensity and cervical lordosis. Correlation was found between pain intensity and neck disability level. This correlation shows that limitations in daily life activities such as reading and carrying things increase as pain increases. Positive correlation between pain intensity and neck awareness shows that pain intensity may be a factor in decreasing neck awareness by affecting neck proprioception and perception. It is thought that body awareness therapies consisting of relaxing, massage, yoga, Pilates, sensory integration and postural exercises to increase overall body awareness may help improving individuals' body perceptions.

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Conflicts of interest

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

REFERENCES

1. Chiu TTW, Ku WY, Lee MH, Sum WK, Wan MP, Wong CY, et al. A study on the prevalence of and risk factors for neck pain among university academic staff in Hong Kong. *J Occup Rehabil.* 2002;12(2):77–91.
2. Norasi H, Tetteh E, Sarker P, Mirka GA, Hallbeck SM. Exploring the relationship between neck flexion and neck problems in occupational populations: a systematic review of the literature. *Ergonomics* 2022; 65(4):587-603.
3. James C, James D, Nie V, Schumacher T, Guest M, Tessier J et al. Musculoskeletal discomfort and use of computers in the university environment. *Appl. Ergon.* 2018; 69:128-135.
4. Cagnie B, Danneels L, Van Tiggelen D, De Loose V, Cambier D. Individual and work related risk factors for neck pain among office workers: A cross sectional study. *Eur Spine J.* 2007;16(5):679–686.
5. Valenzuela-Moguillansky C, Reyes-Reyes A, Gaete MI. Exteroceptive and interoceptive body-self awareness in fibromyalgia patients. *Front Hum Neurosci.* 2017;11:117.
6. Onan D, Gokmen D, Ulger O. The fremantle neck awareness questionnaire in chronic neck pain patients: Turkish version, validity and reliability study. *Spine* 2020; 45(3): E163-E169
7. Gard G, Nyboe L, Gyllensten AL. Clinical reasoning and clinical use of basic body awareness therapy in physiotherapy—a qualitative study? *Eur. J. Physiother.* 2020; 22(1):29-35.
8. Tan LA, Straus DC, Traynelis VC. Cervical interfacet spacers and maintenance of cervical lordosis. *J. Neurosurg* 2015; ;22(5):466–469.

9. Been E, Shefi S, Soudack M. Cervical lordosis: the effect of age and gender. *Spine J.* 2017; 17(6):880–888
10. Bakhtadze MA, Vernon H, Karalkin A V, Pasha SP, Tomashevskiy IO, Soave D. Cerebral perfusion in patients with chronic neck and upper back pain: preliminary observations. *J Manipulative Physiol Ther.* 2012;35(2):76– 85.
11. Price DD, McGrath PA, Rafii A, Buckingham B. The validation of visual analogue scales as ratio scale measures for chronic and experimental pain. *Pain.* 1983; 17(1):45–56.
12. Rheault W, Ferris S, Foley JA, Schaffhauser D, Smith R. Intertester reliability of the flexible ruler for the cervical spine. *J Orthop Sports Phys Ther.* 1989; 10(7):254-256.
13. Elabd A, Ibrahim A, Elhafez H. Kinesio taping versus postural correction exercises on mechanically triggered neck dysfunction. *Int J Ther Rehabil.* 2017;24(4):155–162.
14. Telci EA, Karaduman A, Yakut Y, Aras B, Simsek IE, Yağlı N. The cultural adaptation, reliability, and validity of neck disability index in patients with neck pain: a Turkish version study. *Spine* 2009; 33(11):E362-E365.
15. Schober P, Boer C, Schwarte LA. Correlation coefficients: appropriate use and interpretation. *Anesth. Analg.* 2018;126(5): 1763-1768.
16. Ojoawo OA, Awotidebe OT, Akinola GA. Prevalence of work related musculoskeletal pain among academic and non academic staff of a Nigerian university. *Gulhane Med.J.* 2016;58(4):341.
17. Paksaichol A, Janwantanakul P, Purepong N, Pensri P, van der Beek AJ. Office workers' risk factors for the development of non-specific neck pain: a systematic review of prospective cohort studies. *Occup Environ Med.* 2012; 69(9):610-618.
18. Özsoy S, Gültekin T, Erkin Ö. Determining the exposure level of nurse academicians to risk factors for work-related musculoskeletal disorders and their relationship with pain and fatigue. *Int. J. Sci. Res.* 2019; 75(12/1).
19. Meaza H, Temesgen HM, Redae G, Hailemariam TT, Alamer A. Prevalence of musculoskeletal pain among academic staff of Mekelle University, Ethiopia. *Clin. Med. Insights.* 2020; 13:1179544120974671.
20. Côté JN. A critical review on physical factors and functional characteristics that may explain a sex/gender difference in work-related neck/shoulder disorders. *Ergonomics.* 2012; 55(2), 173-182.
21. Been E, Shefi S, Soudack M. Cervical lordosis: the effect of age and gender. *Spine J.* 2017;17(6):880–888.
22. Harrison DD, Harrison DE, Janik TJ, Cailliet R, Ferrantelli JR, Haas JW, et al. Modeling of the sagittal cervical spine as a method to discriminate hypolordosis: results of elliptical and circular modeling in 72 asymptomatic subjects, 52 acute neck pain subjects, and 70 chronic neck pain subjects. *Spine* 2004; 29(22), 2485-2492.
23. Soylu Boy FN, Özkan Ünlü F, Erdem S, Özdemir G, Külcü Geler D, Akpınar P, et al. Servikal lordoz açıları ve boyun ağrısı ilişkisinin değerlendirilmesi. *Marmara Med J.* 2014;27(2):112–115.

24. Grob D, Frauenfelder H, Mannion AF. The association between cervical spine curvature and neck pain. *Eur spine J Off Publ Eur Spine Soc Eur Spinal Deform Soc Eur Sect Cerv Spine Res Soc.* 2007;16(5):669–678.
25. Yamashita Y, Nishigami T, Mibu A, Tanaka K, Wand BM, Catley M et al. Development and psychometric testing of the Japanese version of the fremantle neck awareness questionnaire: A cross sectional study. *J Pain Res.* 2021;311-324
26. Kristjansson E, Treleaven J. Sensorimotor function and dizziness in neck pain: implications for assessment and management. *J. Orthop. Sports. Phys. Ther.* 2009; 39(5), 364-377.
27. Luo X, Edwards CL, Richardson W, Hey L. Relationships of clinical, psychologic, and individual factors with the functional status of neck pain patients. *Value Heal J Int Soc Pharmacoeconomics Outcomes Res.* 2004;7(1):61–69.
28. Young SB, Aprill C, Braswell J, Ogard WK, Richards JS, McCarthy JP. Psychological factors and domains of neck pain disability. *Pain Med.* 2009;10(2):310–318.
29. Rojas VEA, Pluma AF, Pecos-Martín D, Achalandabaso-Ochoa A, Fernandez-Matias R, Martinez-Merintero P et al. Relationship between neuromuscular mechanosensitivity and chronic neck pain in guitarists: A cross sectional study. *Int. J. Environ. Res. Public Health.* 2021; 18(5):2673
30. Hwang S, Mun MH. Relationship of neck disability index, shoulder pain and disability index, and visual analogue scale in individuals with chronic neck pain. *Phys Ther Rehabil Sci.* 2013;2(2):111–4.